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OBITUARY NOTICE.

THE LATE DR. W. SEDGWICK SAUNDERS.

On January 18 occurred the death of Dr. W. Sedgwick Saunders, who, since 1874, held the important positions of Medical Officer of Health and Public Analyst for the City of London, succeeding Dr. Letheby.

Dr. Saunders was born near Tavistock in 1824; studied medicine at St. Thomas's Hospital; entered the Army as Surgeon, and served in the West Indies and North America; then acted as Medical Officer to the Military Prison at Rochester. Afterwards he commenced practice as a surgeon in the City of London, and was elected to the Court of Common Council, on which he did good service until 1874.

As Medical Officer of Health he was instrumental in effecting numerous improvements in the sanitary condition of the City.

PROCEEDINGS OF THE SOCIETY OF PUBLIC ANALYSTS.

NOTES ON CERTAIN BRITISH PHARMACOPŒIA TESTS.

By C. G. Moor, M.A., F.I.C., and Martin Priest, A.I.C.

(*Read at the Meeting, November* 7, 1900.)

We have recently been engaged in collecting data on the composition of commercial drugs and preparations commonly used in medicine, principally with the view of ascertaining how far they conform to the requirements of the British Pharmacopœia, 1898. The principal object we had in view was the collection of such information as would enable us to draw up suggested standards of purity, and tests which, taken n conjunction with those given in the British Pharmacopœia, would enable one to judge correctly as to the purity or otherwise of commercial drugs, for the purposes of the Food and Drugs Acts.

In studying the British Pharmacopœia from an analytical point of view, we have met with certain points which we think may be interesting to our fellow-analysts.

In two cases we find that the ash limits of the Pharmacopœia require revision, as, if the limits given were adhered to, they would result in the condemnation of genuine samples.

Cardamom Seeds.

Thus, the British Pharmacopœia, 1898, gives a limit of ash of cardamom seeds of 4 per cent. This is intended to exclude mineral matter (small stones) in the unground fruits or the presence of powdered pericarps in powdered cardamom seeds.

We have, however, found that the genuine seeds removed from their pericarps by ourselves may give a higher ash than 4 per cent.

The following table shows the results obtained on various samples of cardamoms:

Ash on Whole Fruit.	Ash on Seeds.	Ash on Pericarps.
5·3	4·03	10·04
5·6	5·9	11·9
—	4·5	10·4
8·2	5·7	8·8
5·4	3·7	8·8
7·7	5·1	10·5
—	3·3	7·1
—	5·1	13·5
6·2	4·2	8·1
—	4·3	—
—	4·5	10·4

In order to distinguish between the powdered seeds and the powdered whole fruit, Greenish recommends a microscopic examination, and we think this might be supplemented by a fibre estimation. We have only determined these factors on one sample, and therefore no attempt must be made to generalize from the following figures:

Seeds.	Husk.	Whole Fruit.
11·0	47·2	21·2

In ashing the seeds and husks, it was noticed by W. Gladwyn that the ash of the husks differed from that of the seeds in being fusible, so estimations of soluble ash and its alkalinity were made, with the following results:

	Seeds.	Husks.
Total ash	5·0	13·3
Soluble ash	2·0	7·1
Soluble ash as K_2O	0·52	2·6

The ether extract was also determined on the whole fruits, and on the seeds and pericarps separately, but the results do not appear to be of any value as a means of distinction. In any further work on the subject, it should be remembered that the cardamoms of commerce vary much in quality, and both wild and cultivated varieties are sold, and that more than one species is in use. The subject is not one of great importance, as cardamoms are employed not so much for any medicinal value that they may contain, but as flavouring agents.

Colocynth.

The colocynth apples of commerce consist of the peeled dried fruit of the *Citrullus colocynthis*. The fruit is imported chiefly from Smyrna, Trieste, France, and Spain. That from Spain is most used. The only part of the fruit that is official is the dried pulp free from seeds. The separation of the seeds from the pulp may be effected by proper means without much difficulty; but, according to Squire, commercially it is carried out very imperfectly, and he states that samples of the pulp commonly contain 10 per cent. of seeds.

The Pharmacopœia tests are as follows: "It should not yield the characteristic reaction with the tests for starch, and only traces of fixed oil should be removed from it by ether." It yields, when dried at 212° F. and incinerated, at least 9 per cent. of ash (indicating absence of seeds).

Squire (*Companion*) states that the seeds contain 15 per cent. of oil, which is in accordance with our own results. We have found that not merely oil, but also some gummy matter, is extracted by ether, both from the seeds and the pulp; hence it might be well to try the effect of a different solvent. We have obtained the following figures for the ash and the ether extract on colocynth pulp and seeds:

Ash on Seeds.	Ash on Pulp.	Ether Extract on Seeds.	Ether Extract on Pulp.
1·7	7·8	11·5	7·8
2·6	12·1	—	5·8
2·27	—	—	—
2·4	8·2	15·3	12·5
3·2	9·2	12·8	5·29
—	—	12·2	1·4
2·4	9·2	14·0	11·1

Additional estimations on pulp alone gave the following figures: 7·3, 8·6, 10·1, 7·2, 8·6, 7·8, 7·0, 10·5.

In all the above cases we carefully separated the seeds from the pulp in the laboratory. Before ashing the pulp, it is of importance to insure its complete desiccation at 100° C., as it is very hygroscopic. It is by no means an easy matter to insure complete incineration, and it would be far better that any future limit of ash should be specified to be the sulphated ash. All the ashes given in the table above were not sulphated, but were completely incinerated in a platinum dish.

It will be noted that from the Pharmacopœia description the pulp alone is official, but the powdered whole apple is sold as a purgative, and is said to be a favourite remedy amongst soldiers. The whole fruit powder is also sold as a moth powder.

With regard to other British Pharmacopœia tests, we venture to offer the following remarks:

Oil of Nutmeg.

The Pharmacopœia directs, under Oleum Myristicæ, that "a little evaporated on a water-bath should not leave a residue which crystallizes on cooling" (absence of the concrete oil of nutmeg). At the beginning of the monograph, the Pharmacopœia defines Oleum Myristicæ as "the oil distilled from nutmeg." Strictly speaking, the

oil which satisfies the Pharmacopœia is not the oil distilled from nutmegs, but the oil which has been fractionated so as to exclude the heavier portion. In a case of a sample of nutmeg oil being examined under the Act and proved to yield a crystalline residue, such an oil might rightly be considered as not in accordance with the Pharmacopœia requirements, but it could not be said that it was not genuine nutmeg oil.

Peppermint Oil.

A somewhat similar case is that of peppermint oil. Among the tests given by the Pharmacopœia is the following: "If a portion of the oil be cooled to $-8{\cdot}3^{\circ}$ C., and a few crystals of menthol be added, a considerable separation of menthol should take place." Some perfectly genuine samples of oil fail to yield any deposit of menthol when treated in this manner, even though they may contain a considerable percentage of menthol, which may be estimated by acetylization. Such an oil is clearly not in accordance with the British Pharmacopœia requirements, but may nevertheless be genuine, and should not be condemned without consideration.

Castor Oil. Croton Oil.

The colour test given in the British Pharmacopœia, namely, the behaviour of castor oil to sulphuric acid, requires revision. It states that the mixture should not become brown; but genuine oils do become brown, but not blackish-brown. Again, in croton oil, "the fresh oil" does not dissolve in alcohol as is required by the British Pharmacopœia, but after the oil has been kept for some time it is soluble, forming a clear solution.

Benzoin. Myrrh. Galbanum.

Certain other British Pharmacopœia descriptions or tests in the case of other drugs either require amendment or more careful definition; thus, benzoin is described as "almost entirely soluble in 90 per cent. alcohol." The words "almost entirely" should be replaced by a definite percentage. The following figures show the very varying amounts of matter insoluble in alcohol found in specimens of fair commercial quality, such as are used in the manufacture of tinctures, etc.

Source.	Amount insoluble in Warm 90 per Cent. Alcohol.
Sumatra ...	8·6, 15·6, 6·8, 6·5, 13·3, 18·1, 8·4, 10·8, 18·1, 8·4, 7·6

Three qualities of Sumatra gave the following results:

No. 1	9·2
No. 2	15·2
No. 3	16·7

In addition, a requirement as to the amount of benzoic and cinnamic acids in benzoin might reasonably be included. Myrrh, again, is a drug in which there is naturally a variable quantity of bark and woody matter; in this case the Pharmacopœia gives no test whatever, with the exception of a colour test to detect the presence of false myrrh. A reasonable limit of ash is 7 per cent., and of matter insoluble in alcohol 70 per cent. Gum galbanum often contains woody matter, and one sample recently examined by us contained as much as 46 per cent. of foreign matter.

Ammoniacum.

Ammoniacum is also liable to contain mineral matters, but no ash limit is given in the Pharmacopœia, and a limit for the matter insoluble in alcohol should also be included. In a previous paper we have dealt with the question of asafœtida, and showed that the greater portion of this drug now in commerce contains excessive quantities of mineral matter.

Strophanthus Seed.

The official strophanthus seed of the Pharmacopœia is the *Strophanthus Kombé*, and the only test given for it besides the description is that "sulphuric acid colours the endosperm, and sometimes the cotyledon, dark green." The Pharmacopœia ascribes the dark green colour to the presence of strophanthin. One might from this expect that a similar dark green colour would be obtained on treating the total solids of an evaporated tincture of strophanthus. We have examined sixteen samples of strophanthus tincture, and in all of these a certain amount of dark green colour was produced; in many cases, however, a red colour predominated, and as there are non-official strophanthus seeds which give a red colour with sulphuric acid, one might conclude that tinctures yielding a red colour with sulphuric acid were prepared from a non-official seed. We therefore obtained specimens of undoubted *Strophanthus Kombé* and prepared tinctures ourselves; these also yielded a mixture of red and green colours when the dried residue was streaked with sulphuric acid.

In no case was the colour entirely green; these results are confirmed by those of Perédès (*Pharm. Journ.*, August 25, 1900, p. 241), who found that the official seed may yield a red colour as well as a green when tested with sulphuric acid.

It must not, therefore, be concluded that a tincture yielding streaks of red as well as green has not been prepared entirely from the official seed.

Strophanthus Tinctures.

Total Solids. Per Cent.	Specific Gravity.	Colour Test.
0·33	0·894	Red and green.
0·42	0·889	Red and green.
(1885) 0·70	0·835	More red than green.
0·41	0·890	Nearly all green.
0·47	0·890	Red, some green.
0·45	0·889	Red.
0·59	0·890	Nearly all green.
(1885) 0·65	0·837	Green and red.
0·46	0·889	Mostly red, some green.
0·52	0·891	Chiefly green, with some red.
0·42	0·896	Red, some green.
0·74	0·894	Red, little green.
0·21	0·883	Chiefly green, some red.
0·48	0·893	Red, some green.
0·40	0·893	Red and green.
0·68	0·891	——
0·44	0·893	——

In the case of several drugs ash limits might with advantage be fixed. We have also recently drawn attention (Pharmaceutical Conference, July, 1900) to the excessive amounts of mineral matter, due to imperfect cleaning, which are often found in arnica, serpentary and valerian roots.

Arnica Root.

In the case of arnica root, clean specimens free from dirt give about 8 per cent. ash, but commercial samples often yield as much as 25 to 30 per cent., owing to the earth mechanically enclosed by the rootlets.

Serpentary Root.

Clean serpentary root gives an ash of about 8 per cent., whereas one specimen gave an ash of 30 per cent., and two samples purchased in powder gave 18 per cent. ash each.

Valerian Root.

Valerian root when clean also yields about 8 per cent. ash, but in three commercial samples we found 13, 15 and 19 per cent., while a specimen of the powdered root yielded 29 per cent.

Araroba.

Araroba is well known as a drug in which the mineral matter is very variable, and no ash limit is specified in the British Pharmacopœia; if, however, it satisfies the Pharmacopœial test of yielding to chloroform not less than 50 per cent. of chrysarobin, the sample may be regarded as of good character.

Pyrethrum, Stavesacre, Coccus Cacti.

In addition to these, other drugs, particularly those in powder, occur in commerce with excessive amounts of mineral matter. As examples of these, we may cite pyrethrum root, two samples containing 18 and 19 per cent. of ash, as against the 5 or 6 per cent. which is natural; stavesacre seeds, containing 26 per cent., whereas the normal is about 12 per cent.; *Coccus cacti*, containing 30 and 41 per cent. of ash, whereas the Pharmacopœia limit is 6 per cent., and the true ash under 4 per cent., the high mineral matter in these cases being intentional additions of French chalk. The attention of analysts may be well directed to this article, for, whether sold for the purpose of medicine or not, the existence of so gross a sophistication is a disgrace.

Saffron.

Saffron has been adulterated for centuries, both with mineral and vegetable matters. The tests given in the British Pharmacopœia are satisfactory so far as they go, but should be supplemented by the following: "Every fragment should on contact with strong sulphuric acid afford a deep though transient blue colour." The dyed fragments which we have found gave a pink colour to sulphuric acid instead of the blue afforded by true saffron.

Santal-wood Oil.

Capsules are sold as containing santal-wood oil which really contain cedar-wood oil or West Indian santal oil, which is derived from a totally different tree to the true santal-wood, and possesses altogether different analytical characters.

Both these adulterants are readily distinguished from genuine santal oil by the ordinary tests and by the colour test with bromide of tin, published by one of us in the ANALYST of August, 1895, p. 174.

SCAMMONY.

Scammony is to be found at the present day adulterated with starch, and out of six samples recently examined only one was genuine.

TINCTURES.

In studying the tinctures of the Pharmacopœia, we have estimated the total solids on a large number of samples (several hundreds), many of which we know to have been prepared strictly in accordance with the official directions.

As the total solids would, in many cases, be taken as a criterion of the correct preparation of the article, particularly in those instances where there is no active principle that can be conveniently estimated, we would point out that, while the solids are remarkably constant in some tinctures, in others there are much greater variations than might be expected. This applies also to the liniments and the liquid extracts of the Pharmacopœia, so that no conclusion should be drawn from the amount of total solids yielded by such preparations, until a large number of figures have been accumulated.

NOTE ON THE ESTIMATION OF GLYCEROL.

BY J. LEWKOWITSCH, PH.D.

(*Read at the Meeting, December* 5, 1900.)

A few years ago Laborde* published a method for the determination of glycerol in fermented liquors, which was based on the following reaction :

$$C_3H_8O_3 + H_2SO_4 = C_3 + SO_2 + 5H_2O.$$

The carbon was supposed to separate out quantitatively, and after suitable washing with hydrochloric acid and treatment with ammonia and heating until the ammonium salts were volatilized, the pure carbon was weighed and calculated to glycerol.

I suppose most of us have been shaking our heads over this method, and I confess that I did not consider it seriously until F. Jean† proclaimed it an important advance in the estimation of glycerol. Indeed, he recommends it for the determination of glycerin in soaps, and fats and oils generally.

I had occasion in my laboratory to examine this method, and the results obtained by following the directions given by Jean are set out in the following table :

* *Ann. Chim. Analyt. Appliquée*, iv., 76, 110. † *Ibid.*, v., 211.

Sample.	Glycerol found by Acetin Method.	Glycerol found by Bichromate Method.	Glycerol found by Carbon Method.	
			Including Ash.	Free from Ash.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
No. 1	—	13·79	4·76	
			13·61	
			12·76	
			16·26	
			10·96	
No. 2	86·21	—	89·54	88·39
			68·23	67·23
			73·2	72·25
			59·13	58·61
			77·73	77·2
			83·07	81·74
No. 3	80·47	—	68·9	64·95
			57·35	54·41
			85·60	82·07
			69·26	68·09
			97·98	88·72
			44·50	40·60
No. 4	81·31	—	76·92	75·9
			80·36	79·0
No. 5	—	—	3·39	3·28
			3·19	3·03
			4·1	3·98
			1·18	1·01
			0·29	0·18

I think a glance at the figures shows that you can obtain any result you please, and it is easy to regulate the percentage if one desires to do so, for it is almost impossible to prevent the finely divided carbon from firing, however careful one is in driving off the ammonium salts.

It is clear that the carbon will be more or less contaminated with ash, and in a number of experiments the ash has been deducted.

It is very unpleasant to have to publish figures of this kind, but if I can elicit more correct directions from the authors of this method, or, if that be impossible, if I can prevent some of my colleagues from spending as much time as my assistants have done, I think I may claim to have done them some little service.

My thanks are due to Messrs. C. D. Robertshaw and G. Warburton, who have carried out the determinations.

ON THE EXAMINATION OF VARNISH RESINS.

By J. Lewkowitsch, Ph.D.

(*Read at the Meeting, December* 5, 1900.)

I think it will be generally admitted that the analysis of varnishes is a *terra incognita*, if it is a question of determining by chemical means what gum has been used in the preparation of an oil varnish. In his despair the analyst will try to use the methods which have proved of such enormous advantage in fat analysis, and, as is well known, a number of determinations of the acid value, saponification value, and iodine values have been carried out, but their use for the diagnosis of gums in mixtures such as we have to deal with is almost infinitesimal.

It struck me that it has been generally* overlooked that the determination of the so-called "constants" has been carried out on the original gums as obtained in the market, whilst the gums are, of course, subjected to a process of "running" or melting, which is accompanied in some cases by destructive distillation.

In the course of an examination of varnishes in my laboratory I had occasion to collect a few numbers representing the equivalent of what is termed in fat analysis "acid value," "saponification value," etc., and I have placed side by side with the numbers obtained with the most frequently used resins in the original state, those found after heating them to 300° C.

The result is very discouraging indeed, and I should certainly not have published the figures if I had not been asked to do so by a scientific varnish-maker, who thinks that these figures will be of value. So far, I cannot see that they will help in the analysis of varnishes, and the present paper must, therefore, be looked upon as merely putting on record some numbers such as anyone might get by a cursory examination.

I may add that the "acid value" was determined in the same manner as is done in fat analysis, with finely powdered material, regardless of whether the gum dissolved completely or not. If an excess of aqueous caustic potash is added, and back titration resorted to after some time, higher numbers are obtained, and it is possible to arrive at any figure for the acid value, provided one allows to stand long enough, and keeps adding fresh excess of alkali after neutralization, and again allows to stand. In some cases acid values were thus obtained which were far higher than the saponification value, a fact which would point to the gradual degradation of the constituents of the gums. The arbitrary fixing of a certain time during which an excess of alkali is allowed to act on the gum would therefore appear to lack scientific foundation.

As the bromine addition method was done in most cases in acid solution, the bromine substitution value was not determined throughout. This will be done in future.

I think I have made it sufficiently clear that I do not attach much value to the figures given in the tables for purposes of detecting the gums used in the preparation of an oil varnish, quite apart from the fact that commercial samples show the greatest possible divergencies. Perhaps other tests I have in hand may lead to

* Compare, however, R. Williams, Analyst, 1898, 254.

more useful information (such as oxygen absorption, Twitchell's resin determination, Liebermann's starch colour reaction, and a few more that readily suggest themselves to the analyst).

I am indebted to my assistants, Messrs. C. D. Robertshaw and G. Warburton, for the figures in the following table:

	Original Gums.						Gums after Heating to 300° C.				
	Acid Value.	Sap. Value.	Unsap., %	Iodine Value. ICl.	Iodine Value. Br.	Sol. in Alcohol, %	Acid Value.	Sap. Value.	Unsap., %	Iodine Value. ICl.	Iodine Value. Br.
Copal, Commercial ...	109·8	143·1	7·96	135·5	183·6	93·06	26·49	85·4	14·73	124·3	181·3
Copal, Commercial ...	42·43	66·82	14·99	191·2	114·6	54·83	24·94	61·04	46·40	143·7	233·5
Copal, Sierra Leone ...	72·83	119·03	18·81	105·7	96·05	—	12·89	114·9	17·22	125·5	173·6
Copal, Manilla ...	127·6	175·17	15·98	137·9	188·2	—	68·21	136·3	22·99	133·3	186·4
Copal, Brazil	108·99	171·4	7·66	127·7	72·66	—	46·25	113·8	38·74	136·7	225·9
Copal, Sierra Leone ...	65·7	110·5	16·27	94·55	117·0	—	15·32	123·8	22·31	95·23	135·4
Cowrie ...	37·39	53·84	20·07	90·99	—	—	17·14	61·07	10·39	67·70	74·71
Mastic ...	52·73	81·79	51·13	175·7	185·0	84·41	23·23	50·24	49·28	165·0	217·8
Shellac, Dark	61·13	203·0	3·56	35·57	13·25						
Sandarac, Mogador...	134·39	143·42	13·2	112·2	99·98	—	64·84	136·14	14·28	126·4	69·13
Sandarac, Austral....	131·15	134·32	17·44	125·4	63·83	—	106·6	137·26	9·93		
Animis No. 1	18·69	73·15	6·3	105·3	182·7	—	9·25	58·73	—	106·1	207·4
Animis No. 2	30·22	93·5	6·85	96·21	95·85						
Dammar ...	35·22	32·73	75·96	127·5	169·4	—	10·85	60·44	86·57	127·0	196·8
Amber ..	16·7	121·27	18·86	58·98	82·82						
Succinit* ...	11·24	113·68	7·06	55·05	78·4	—	10·60	99·19	16·25	74·34	147·8
Colophony...	—	—	—	—	—	—	146·46	153·01	15·94	133·7	302·1

Discussion.

Mr. Hehner agreed with Dr. Lewkowitsch that it was useless to examine the original gums, as they, on boiling, underwent considerable chemical change. The difficulty was rendered greater by the fact that the gums, as a rule, were not heated by themselves, but were mixed with oil. It was interesting to notice that a gum which, like mastic, had as much as 51—or of 49 after heating—of unsaponifiable matter, nevertheless had an iodine absorption of 175 before heating, or 165 after heating. This seemed strongly to suggest that the unsaponifiable matter itself had a high iodine absorption.

Mr. A. Marshall said that, in the determination of bromine absorption, working with carbon tetrachloride in the manner which he had described in a recent paper before the Society of Chemical Industry (*Journ. S. C. I.*, March, 1900), he had lately obtained some very interesting results; and he thought that possibly a similar process applied to some of these gums might yield results of value.

Dr. Rideal suggested that more might be learnt as to the changes which took

* This is a species of amber.

place in these gums as the result of heating by taking one particular sample of gum and tracing the changes produced by heating it to different temperatures.

Mr. C. T. Tyrer said that there were on the market so-called varnish gums which were practically manganese resinates, containing considerable proportions of manganese ; and probably in such cases the ordinary methods of analysis could not be successfully applied.

Mr. Mitchell inquired whether the author had tried amyl alcohol as a solvent in the determination of the saponification value. Its use was said to produce values differing considerably from those obtained with ordinary alcohol.

Mr. Marshall said that in determining the acid value it was necessary, as nearly as possible, to dissolve the gum entirely, and some solvent, or mixture of solvents, should be used by means of which it was possible to effect this.

Dr. Lewkowitsch said that where only one gum was present the matter was comparatively easy to deal with, but when the gum consisted of a mixture of various copals, for instance, the question of identifying them was almost impossible to solve ; for even among gums which were sold by the same name, trade samples varied so much that experts, judging by external indications, were frequently misled. In addition, information was in many cases not obtainable as to the treatment to which samples had been subjected, owing to the secrecy which prevailed in the trade. He was afraid that an investigation of the unsaponifiable matter would not prove of very much assistance. The figures were more or less accidental, depending mainly on the time of boiling with caustic potash. In some cases the figures were widely divergent, though in others—in the case of sandarac especially—they were more concordant. He was afraid that the adoption of Mr. Marshall's suggestion would not result in any improvement. As a matter of fact, the choice of an acetic acid solution in the bromine absorption determination in these particular cases had been due merely to a personal dislike of the use of carbon disulphide or tetrachloride ; but the whole matter had been thoroughly investigated, and in some cases bromine addition values and bromine substitution values had been determined, although they were not given in the tables. He had not been able to spare sufficient time to go further into the matter and employ a menstruum which could completely dissolve the gums, and the question of time also had led him to adhere to one temperature, namely, that which was most commonly adopted in operations conducted on a large scale. He ought, perhaps, not to have referred to "varnish gums," but to "gums used in varnish-making." All these gums were of course added to oils which were afterwards boiled with certain proportions of manganese resinate, or linolate, etc., and the metal was removed in the course of analysis. He had not tried amyl alcohol as a solvent, but he would be surprised if it were actually a fact that higher figures were obtained by its use, provided the saponification in alcoholic solution was carried out properly. The only explanation would seem to be that it was not pure.

THE COMPOSITION OF INDIAN COWS AND BUFFALOES' MILK.

By J. Walter Leather, Ph.D., F.I.C.

Information as to the composition of Indian cows and buffaloes' milk will doubtless be of interest to members of the Society of Public Analysts, and I submit now the following results of analyses made by myself. I may mention than an idea had become current in India that the milk of Indian cows is different in composition to that of European cows, and accordingly complete analyses were in each case made. As to the composition of buffaloes' milk, no reliable information existed previously.

In Table I. are given analyses of milking from a number of cows at the Poona Dairy Farm (Bombay Presidency), and in Table II. similar information regarding milk from cows of the Saidapet herd (Madras). Table III. exhibits the composition of buffaloes' milk (Poona herd).

Firstly, as to Indian cows' milk. It is found to differ in no essential particulars from that met with in Europe. The relations existing between the specific gravity, the solids-not-fat, and the fat agree well in all cases with those which Richmond and others have found in the case of milks from English cows. So also, as shown in Table IV., the relationship between the milk-sugar, the proteids, and the mineral matter agrees well with the proportions 13 : 9 : 2. The percentage of butter-fat is high, varying from 4 to 6. Indian cows' milk is invariably very nearly white and the butter very pale yellow, unless coloured artificially.

Secondly, as to buffaloes' milk. It will be seen that the majority of the samples analysed are characterized by an extraordinarily high proportion of butter-fat, 7 and 8 per cent. being common, and in one case close on 10 per cent. of fat was found. Buffaloes' milk is white and the butter is also usually quite white.

As will be seen from Table III., the relation existing between the specific gravity, the solids-not-fat, and the fat is the same as for cows' milk, the solids-not-fat, when calculated by Richmond's formula, agreeing well with those found by analysis.

The percentage of proteids in buffaloes' milk is distinctly higher than in cows' milk, and varies from 3·5 to 4·3 per cent. The percentages of milk-sugar and mineral matter correspond very closely with those of cows' milk. On the other hand, the relationship between these three ingredients is not the same as for cows' milk. In one particular sample (that of the mixed milk of the herd) the percentage of proteids was higher than I found in most of the individual milks; but this does not materially alter the fact. If one takes the mean figures, the relationship works out to about 10 : 12 : 2. It is probable that the proportion of proteids is necessarily higher in a milk containing so much butter-fat, in order that the albuminoid ratio may be maintained.

TABLE I.—COMPOSITION OF INDIAN COWS' MILK. POONA HERD (BOMBAY), 1899.

	Janki, March 1.	Sind Cows.						Half-bred Deccani-Kalyani, 31/1/99.	Aden Cows.		Aden-Sind Yam-meni, 4/2/99.	Aver-age Milk of Cows, 6/2/99.	Aver-age Milk of Cows, 28/2/99.
		Janki, 24/1/99.	Sama-rath, 25/1/99.	Sama-rath, 26/1/99.	Sama-rath, 27/1/99.	Sunda, 29/1/99.	Sabin, 30/1/99.	Bhawa, 1/2/99.	Ner-mada, 2/2/99.	Kar-angi, 3/2/99.			
Water...	87·35	87·51	85·76	85·88	85·67	86·82	84·72	85·27	84·89	86·68	87·27	86·02	86·35	86·32
Fat ...	3·46	3·65	4·89	4·88	5·20	4·10	6·11	5·59	5·77	4·43	4·28	4·64	4·75	4·91
Proteids	3·65	3·16	3·68	3·61	3·54	3·14	3·62	3·55	3·89	3·06	2·76	3·35	3·31	3·33
Milk-sugar..	4·88	4·65	4·37	4·56	4·56	4·58	4·13	4·65	4·04	4·85	4·80	4·86	4·63	4·58
Mineral matter	0·72	0·68	0·71	0·78	0·86	0·69	0·77	0·67	0·74	0·69	0·66	0·83	0·70	0·73
	100·06	99·65	99·41	99·71	99·83	99·33	99·35	99·73	99·33	99·71	99·77	99·70	99·74	99·07
Solids-not-fat	9·19	8·84	9·35	9·24	9·13	9·08	9·17	9·14	9·34	8·89	8·45	9·34	8·90	8·77

TABLE II.—COMPOSITION OF COWS' MILK. SAIDAPET HERD (MADRAS), 1900.

	Average Milk of Herd, 29/3/00.	Average Milk of Herd, 4/4/00.	Average Milk of Herd, 7/4/00.	Baggeon II., 28/3/00.	Govindi, 2/4/00.	Parvati, 3/4/00.	Manachu II., 5/4/00.	Poongan, 6/4/00.	Manachu III., 9/4/00.
Water	86·27	86·87	85·97	86·14	85·52	84·48	86·13	86·98	86·08
Fat	4·00	4·14	4·68	4·41	5·48	6·07	4·57	3·52	4·62
Proteids	3·15	3·16	3·23	3·23	3·14	3·27	3·44	3·27	3·25
Milk-sugar ...	4·82	4·81	4·92	5·03	4·68	4·66	4·56	4·96	5·05
Mineral matter ...	0·76	0·74	0·72	0·76	0·70	0·72	0·77	0·75	0·77
	99·00	99·72	99·52	99·59	99·52	99·20	99·47	99·48	99·77
Solids-not-fat ...	9·73	8·99	9·35	9·45	9·00	9·45	9·30	9·50	9·30
Specific gravity at 15·5° C.	1033·50	1032·0	1032·0	1033·0	1031·0	1033·0	1032·0	1034·0	1033·0
Solids-not-fat calculated by Richmond's formula	9·32	8·97	9·08	9·27	8·99	9·60	9·05	9·34	9·31

TABLE III.—INDIAN BUFFALOES' MILK. POONA HERD (BOMBAY).

	Jaffarabadis.				Suratis.		
	Nevasi, 6/2/99.	Nevasi, 13/2/99.	Champa, 7/2/99.	Thami, 10/2/99.	Kevada, 8/2/99.	Phonga, 9/2/99.	Mangel, 11/2/99.
Water	86·43	85·09	82·84	84·05	82·63	83·38	81·74
Fat	4·08	5·78	7·32	6·89	7·74	6·86	8·66
Proteids	3·29	3·24	4·36	3·53	3·75	3·99	4·32
Milk-sugar	5·12	5·09	4·42	4·70	4·94	4·70	4·66
Mineral matter ...	0·80	0·68	0·75	0·82	0·68	0·72	0·80
	99·72	99·88	99·69	99·99	99·74	99·65	.100·18
Solids-not-fat ...	9·49	9·13	9·06	9·63	9·63	9·76	9·60

TABLE IV.

	Nevasi, 28/2/99.	Gaura, 2/3/99.	Jamadar, 3/3/99.	Kaoli, 3/3/99.	Bhadra, 4/3/99.	Asman, 4/3/99.	Gulab, 6/3/99.	Mixed Milk of Kirkee Buffaloes.	Rekhmi, 6/3/99.	Avadi, 7/3/99.	Chandi 7/3/99.
Water	85·78	82·16	80·16	81·57	82·89	81·15	82·63	82·22	82·74	82·52	83·23
Fat	5·17	8·14	9·95	8·79	7·56	8·81	7·59	8·09	7·42	7·52	6·95
Proteids ...	3·31	4·33	4·04	3·86	3·62	4·31	4·39	4·34	3·91	3·89	3·89
Milk-sugar ...	4·97	4·27	4·58	4·66	4·87	4·61	4·89	4·56	4·65	4·60	4·67
Mineral matter	0·70	0·77	0·79	0·71	0·71	0·76	0·73	0·76	0·81	0·80	0·75
	99·93	99·67	99·52	99·59	99·65	99·64	100·23	99·97	99·53	99·33	99·49
Solids-not-fat ...	9·05	9·70	9·89	9·64	9·55	10·04	9·78	9·69	9·84	9·96	9·84
Specific gravity at 15·5° C. ...	1034·5	1032·1	1031·2	1032·0	1032·9	1032·9	1032·7	1032·1	1034·3	1033·8	1033·9
Solids-not-fat, calculated by Richmond's formula ...	9·79	9·79	9·93	9·90	9·87	10·12	9·83	9·78	10·19	10·09	10·00

ABSTRACTS OF PAPERS PUBLISHED IN OTHER JOURNALS.

FOODS AND DRUGS ANALYSIS.

The Detection of Artificial Red Colouring Matters in Wine. J. Bellier. (*Ann. de Chim. anal.*, 1900, v., 407-413.)—For the detection of archil, ammoniacal cochineal, phytolacca, or beetroot-juice in wine, the author advocates the use of a reagent consisting of: Mercuric oxide, 5 grammes; ammonium sulphate, 10 grammes; and ammonium hydroxide (specific gravity, 0·920), 15 c.c.; with sufficient water to make the solution up to 50 c.c.

In testing a wine, 10 c.c. are shaken with 1 c.c. of this reagent and filtered. The filtrate from pure wines is colourless, yellow, or sometimes gray, with a tinge of blue or green in the case of wines containing very little acid. Wines artificially coloured, on the other hand, yield a filtrate of a more or less pronounced red colour.

Instead of this reagent, the two following solutions may be employed: (*a*) Mercuric chloride, 10 grammes; ammonium chloride, 5 grammes; water, 100 c.c. (*b*) Glacial acetic acid, 10 c.c.; water, 65 c.c.; ammonium hydroxide (0·920 specific gravity), 25 c.c.

Ten c.c. of the wine are shaken with 1 c.c. of (*a*), then 1 c.c. of (*b*) added, and the whole shaken and filtered. The reaction is a little more sensitive than the first one, but requires greater care. The filtrate must be nearly neutral, and its colour must be

noted immediately after filtration, since with some wines it becomes orange on standing.

Archil, when present, is partially retained by the precipitate in either test, but can be dissolved off the filter by absolute alcohol.

To determine to which of the four colouring matters the red colour is due, the filtrate, preferably as obtained by the second method, is divided into two parts. To one of these is added an excess of clear lime-water, whilst an excess of freshly-calcined magnesia is added to the second. The tubes are left for thirty minutes, with occasional agitation, after which an excess of acetic acid is added to the first tube.

1. If the liquid regains its red colour, archil or cochineal is present. To distinguish between them, 10 c.c. of the wine are mixed with 0·2 to 0·3 gramme of stannous chloride and an excess of finely-powdered calcium carbonate, shaken at intervals for ten to fifteen minutes, and filtered. If the filtrate is red, cochineal is indicated; if colourless, archil.

2. If the colour is not restored by acetic acid, phytolacca or red beetroot is indicated.

The filtrate of the tube containing the magnesia is mixed with acetic acid in excess and filtered, a colourless or yellow filtrate indicating phytolacca, whilst a restoration of the red colour points to the presence of beetroot. This reaction is not always successful.

As a further test, 10 c.c. of the wine are boiled with 1 c.c. of a reagent prepared by dissolving 40 grammes of powdered ammonium sulphate and 20 grammes of mercuric oxide in a little water, and making the solution up to 100 c.c. The filtrate from this test is colourless or yellow in the presence of phytolacca or beetroot, and red with archil or cochineal. C. A. M.

The Detection and Estimation of Dulcine in Beverages. J. Bellier. (*Ann. de Chim. anal.*, 1900, v., 333-337.) Dulcine or sucrol is phenetol carbamide.

$$CO\begin{matrix}NH.C_6H_4O.C_2H_6.\\ NH_2\end{matrix}$$

It possesses about 200 times the sweetening power of sugar. It is only slightly soluble in water (1·25 gramme per litre), ether, benzene, and chloroform, but dissolves readily in alcohol, ethyl acetate, and amyl acetate.

To extract it from lemonade, dilute fruit-syrups, etc., all that is necessary is to shake the liquid, after being made alkaline, with ethyl acetate. But in the case of beer, wine, and certain fruit-syrups, an emulsion is formed and other substances are also extracted. To obviate this, fruit-syrups, preserves, etc., are diluted, an excess of basic lead acetate added, the lead removed by precipitation with sodium sulphate, and the filtrate made alkaline, and extracted with ethyl acetate.

Wine is best treated by adding 2 grammes of mercuric acetate, shaking, adding a slight excess of ammonium hydroxide, and filtering.

In the case of beer, 2 to 3 grammes of pulverized sodium phosphotungstate and 10 to 20 drops of sulphuric acid are added to 200 c.c., the liquid allowed to stand for a few minutes after shaking, and then filtered, and the filtrate rendered alkaline with ammonium hydroxide.

The clear filtrate obtained by one of these methods is shaken with neutral ethyl acetate in the proportion of 50 to 200 c.c., the extract filtered, and the solvent evaporated. In most cases crystals are obtained when the quantity of dulcine exceeds 0·04 to 0·05 gramme per litre. If necessary, the residue is purified from fat and resinous substances by repeatedly treating it with hot water, filtering, and evaporating the solution to dryness. When sufficiently pure the final solution in hot water is evaporated to dryness in a porcelain basin, the residue treated with 1 to 2 c.c. of sulphuric acid and several drops of formaldehyde, and after fifteen minutes the mixture diluted with 5 c.c. of water. In the presence of dulcine a more or less pronounced turbidity or precipitate is obtained. When it only amounted to 0·01 gramme per litre the reaction is not very pronounced, and in such cases should be confirmed by Jorissen's reaction.

The purified dulcine is dissolved in 2 to 3 c.c. of boiling water, and the solution heated on the water-bath for five minutes with 4 or 5 drops of a solution of mercuric nitrate, prepared by dissolving 2 grammes of mercuric oxide in dilute nitric acid, adding sodium hydroxide solution until a slight permanent precipitate is formed, diluting to 15 c.c., and decanting the clear liquid. The tube is then withdrawn from the bath, no notice being taken of any precipitate, and a small quantity of lead peroxide introduced. The mercuric compound and the excess of the lead peroxide rapidly subside, and when dulcine is present to the extent of 5 milligrammes per litre the upper layer has a distinct violet colour.

For a quantitative estimation, any alcohol must be eliminated from the liquid, and two extractions with ethyl acetate made. The residues are united, purified, and dissolved in 1 to 5 c.c. of sulphuric acid, several drops of formaldehyde added, and the liquid diluted to 10 to 50 c.c. after 50 minutes.

After twenty-four hours the precipitate is collected on a dried filter of known weight, washed with water, dried and weighed.

By this process the author has obtained the following results with beverages containing 0·1 gramme of dulcine per litre :

200 c.c. of	Insoluble Compound. Gramme.
Lemonade	0·018
,, ...	0·017
Wine	0·020
Beer	0·021

Saccharin does not form an insoluble compound under these conditions.

C. A. M.

The Estimation of Gluten in Flour. Marion and Manget. (*Ann. de Chim. anal.*, 1900, v., 249-252.)—A method of estimating the value of a flour for baking purposes has been based upon a determination of the ratio of gluten to gliadin by Fleurent (*Bull. du Ministère de l'Agriculture*, December, 1899), and subsequently a similar process has been devised by H. A. Guess (ANALYST, xxv., 267). Fleurent's method consists in kneading in the usual manner 33·33 grammes of the flour, and triturating the residual gluten with a small quantity of 70 per cent. alcohol containing 0·3 per cent. of potassium hydroxide. The mass is then transferred to a stoppered

flask with the aid of the alkaline alcohol, the total amount of which should be 80 c.c. The mortar is rinsed with 70 per cent. alcohol (free from alkali), the washings being added to the contents of the flask, which are now shaken with glass beads until the disintegration is complete. After neutralizing the alkali with carbon dioxide, the liquid is made up to 150 c.c. with 70 per cent. alcohol, and filtered. Fifty c.c. of the filtrate are evaporated to dryness, and the residue dried at 100° to 105° C. and weighed. The amount of potassium carbonate present is deducted, the difference giving the amount of gliadin. The gluten is then obtained by calculation.

In the modification recommended by the authors, the gluten from the kneading is allowed to dry in the air and weighed. It is then shaken for two minutes in a glass vessel with 80 c.c. of Fleurent's solution and a dozen glass balls of 1 centimetre in diameter, and subsequently for fifteen to twenty minutes after the introduction of some small glass beads.

The turbid liquid is poured off into a flask with a long neck, graduated from 200 to 210 c.c. in tenths of a c.c., the flask and residual glass balls being washed with exactly 120 c.c. of pure 70 per cent. alcohol. The excess of the total liquid over 200 c.c. represents the volume of gluten. Fifty c.c. are evaporated, and the residue dried at 100° to 105° C., and weighed, giving, after making a deduction for the potassium hydroxide present, the weight of dry gluten. This is calculated on the volume read on the graduated flask. The residual liquid is neutralized with carbonic acid, and the gliadin estimated in 50 c.c. of the filtrate by Fleurent's method.

The following results are given in illustration:

	Hungarian Groats.		Superior Flours.				
			1.	2.	3.	4.	5.
Gluten, moist, per cent.	22·85	22·28	26·37	20·70	23·08	21·02	20·54
,, dry ,, ...	8·42	7·86	8·69	6·89	7·84	7·19	7·26
,, ,, by weight	8·39	7·56	8·93	6·79	7·67	6·91	7·47
Gliadin	5·52	5·23	5·57	4·79	4·50	4·63	4·97
Ratio : $\frac{\text{gluten}}{\text{gliadin}}$	$\frac{25}{48}$	$\frac{25}{56}$	$\frac{25}{41·44}$	$\frac{25}{59·35}$	$\frac{25}{35·48}$	$\frac{25}{50·76}$	$\frac{25}{49·50}$

C. A. M.

ORGANIC ANALYSIS.

The Use of Tannin in purifying Residues containing Alkaloids. C. Kippenberger. (*Zeit. anal. Chem.*, 1900, xxxix., 627-633.)—The freshly-precipitated compounds of tannin with alkaloids can be separated from proteids by means of acetone, whilst the compounds of tannin with albumin or peptone do not yield any trace of the proteid constituent to this solvent, although some tannin is dissolved.

In forensic analysis the substance to be examined is extracted with *acidified* alcohol, and the extract evaporated. After mixing the residue with a little water and acetone, tannin is added, and the paste gently heated with acetone slightly acidified with hydrochloric acid, and filtered. The filtrate, after the addition of 10 to 20 c.c. of glycerol with a little water and 1 or 2 c.c. of hydrochloric acid, is

evaporated on the water-bath, and the residue diluted with water and filtered. It can then be extracted with chloroform.

When alkaloids which are volatile with steam are present, the method formerly described by the author (ANALYST, xx., 201) of direct extraction with glycerol containing tannin is advisable. C. A. M.

The Constituents of German Rose Oil. H. Walbaum and K. Stephan. (*Berichte*, 1900, xxxiii., 2302-2308.)—According to Bertram and Gildemeister (*Journ. prak. Chem.*, 1894, xlix., 185), both Bulgarian and German rose oil consist essentially of geraniol and odourless hydrocarbons. Citronellol has also been discovered by Tiemann in the Bulgarian oil. As these two substances did not possess the odour of rose oil when mixed, the authors have examined a large quantity of German oil to discover what other substances were present. By fractional distillation, partly with steam and partly under reduced pressure, the constituents of lower boiling-point than geraniol were separated. These were refractionated under reduced pressure, yielding finally about 300 grammes of distillate boiling from 55° to 100° C. under 13 millimetres pressure, and a fraction of higher boiling-point which still contained geraniol.

The lower fraction yielded on treatment with bisulphite an aldehyde identified as nonyl aldehyde, and the residue left after the removal of this was found to contain linalool.

The fraction of the oil boiling above 100° C. at 14 millimetres pressure was treated with bisulphite, and citral was identified in the compound produced. After removal of the citral, the fraction was found to contain a small quantity of phenyl-ethyl alcohol.

Citronellol was also identified in the oil, and in the authors' opinion other odoriferous substances were probably present. C. A. M.

The Occurrence of Phenyl-ethyl Alcohol in Rose Petals and Rose Oil. H. Walbaum. (*Berichte*, 1900, xxxiii., 2299-2302.)—In a previous communication (*Berichte*, xxxiii., 1903) the author has shown that phenyl-ethyl alcohol is obtained by extracting dried rose petals, and that it is also present to a slight extent in normal rose oil. On extracting 90 kilos of the petals with ether, and distilling the residue of the extract in a current of steam, a turbid aqueous distillate was obtained, from which about 80 grammes of a brown oil could be extracted with ether. This was found to consist for the most part of phenyl-ethyl alcohol.

Since the ordinary rose oil obtained by distillation of the petals with steam never possesses the exact odour of the rose, numerous attempts have been made from time to time to extract the odoriferous constituents with petroleum spirit, carbon bisulphide, or other solvents. As in the case of the dried flowers, it was found that the freshly-plucked blossoms when extracted with petroleum ether also yielded an oil consisting principally of phenyl-ethyl alcohol. Geraniol, which is a principal constituent in the oil obtained by distillation of the fresh blossoms with steam, is only present to a small extent in the extracted oil. The author considers that this great difference

between the distilled and extracted oils renders a re-examination of normal rose oil necessary. C. A. M.

The Determination of the Acid and Saponification Values of Wax. Otto Eichorn. (*Zeit. anal. Chem.*, 1900, xxxix., 640-645.)—Amyl alcohol is recommended instead of ordinary alcohol for these determinations.

Acid Value.—About 6 grammes of the sample are heated to the boiling-point with 60 c.c. of pure amyl alcohol, and then titrated in the ordinary way. The advantage over the ordinary method is that the titration can be completed without the necessity of again heating the liquid, and any partial saponification is thus obviated. The author therefore obtained results considerably lower in this way than by the older method. Thus:

	Beeswax.		Japan Wax.	Carnauba Wax.
Amyl alcohol	22·34	19·18	19·06	9·71
Ethyl alcohol	22·8	19·60	20·4	—

Saponification Value.—About 5 grammes of the wax are heated in the water-bath with 60 c.c. of amyl alcohol and 25 c.c. of N potassium hydroxide, a blank determination being simultaneously made. The excess of alkali is titrated after thirty minutes.

The author states that in every instance the ordinary method yielded too low results in the case of the waxes and mixtures which he examined.

The following results show that the saponification by the amyl alcohol method is complete in fifteen minutes.

	Fifteen Minutes' Saponification.	Thirty Minutes' Saponification.	Fifty Minutes' Saponification.	Ninety Minutes' Saponification.
Wax No. 1	94·6, 94·3 } 94·4	94·5, 94·5 } 94·5	94·3, 94·4 } 94·3	94·4
Mixture of wax No. 1, 75 %, and ceresin, 25 %. Value calculated on the wax ...	94·4	94·2	94·4	—
Wax No. 5	95·7, 95·1 } 95·4	95·4, 95·4 } 95·4	95·3, 95·0 } 95·1	95·3

C. A. M.

The Analysis of Gutta-percha. H. Bornträger. (*Zeit. anal. Chem.*, 1900, xxix., 502-504.)—Crude commercial gutta-percha has the following composition, according to the investigations of different chemists: Water, 1 to 1·5; dirt (wood and soil), 3 to 5; pure gutta, 30·5 to 83·5; albane, 7·0 to 44·5; and fluavile, 3·0 to 21·0 per cent.

It is generally accepted that gutta is a hydrocarbon ($C_{10}H_{16}$), and that albane ($C_{10}H_{16}O$) and fluavile ($C_{40}H_{64}O_3$) are only oxidized gutta. The author finds that this is only true of albane, which is insoluble in cold alcohol, and which consists of three separate resinous substances. Of these a_1, which constitutes about 30 per cent. of the albane, is a light yellow resin oil, which distils at 200° C.; a_2 (about

30 per cent.) is a dark yellow oil distilling at 250° C.; and a_3 (about 40 per cent.) is a solid resin resembling colophony.

Fluavile, on the other hand, is a definite substance, which distils as a colourless resin oil at 105° C. It is soluble in cold alcohol.

Estimation of Water.—Two grammes of the finely-divided sample are dried in a weighed tube in a current of air at 100° C. until the weight becomes constant.

Estimation of Dirt.—One gramme of the substance is heated on a water-bath under a reflux condenser for twelve hours with 50 c.c. of benzene. The liquid is then filtered, and the flask and filter washed with hot benzene until the washings leave no residue on evaporation. The filter and flask are then dried at 110° C., and weighed.

Estimation of Pure Gutta.—The benzene with the resinous compound in solution is evaporated to about 50 c.c., mixed with 100 c.c. of absolute alcohol, and allowed to stand for two hours on the water-bath. The pure gutta is precipitated and separated, washed three times with hot alcohol, dried at 100° C., and weighed.

Determination of Albane and Fluavile.—These are generally estimated together by difference. For a separate determination the author evaporates the alcohol and benzene filtrate from the estimation of the gutta to 50 c.c., and leaves it to cool in a weighed basin. After twenty-four hours the supernatant liquid with the fluavile in solution is decanted, and the deposit of albane washed three times with cold alcohol, dried at 80° C., and weighed. The fluavile is found by difference, or by evaporating its alcoholic solution after removing the albane. If a determination of its three constituents be required, the dried albane may be fractionally distilled.

An analysis of a sample of crude gutta-percha by the above method gave the following results: Water, 1·5; dirt, 2·5; pure gutta, 77·5; fluavile, 6; albane a_1, 3·8; albane a_2, 3·7; and albane a_3, 5 per cent. (*cf.* ANALYST, xxi., 74, and xxii., 328).

C. A. M.

The Determination of Proteids in Feeding Stuffs. H. Schjerning. (*Zeit. anal. Chem.*, 1900, xxxix., 633-639.)—As the author has found that uranium acetate precipitates true peptones, whilst Stutzer's reagent does not, he has made experiments to determine whether peptones are actually present in feeding stuffs.

He has obtained the following results in his analysis of various samples by the method previously described (ANALYST, xxiii., 326):

	Molasses Fodder.	Cotton-seed Cake.	Blood-molasses Fodder.	Sunflower Cake.	Rape-seed Cake.	Palm-oil Cake.
Albumins	9·8	2·0	0	51·8	49·1	0
Denucleïn	10·7	58·0	14·3	10·3	5·0	31·2
Propeptone	1·8	8·0	4·8	5·1	11·7	6·2
Peptone	1·8	0	0	0	3·3	0

From these figures, the conclusion is arrived at that peptones are not present in ordinary feeding stuffs, or, if so, only in very minute quantities; and that, therefore, Stutzer's reagent and uranium acetate should precipitate practically the same proportion of nitrogen. This was confirmed experimentally.

In the method finally recommended, 0·5 to 1 gramme of the sample is mixed with 100 c.c. of water, and left for twenty hours, with frequent agitation. The contents of the beaker are then heated to 50° C. in the water-bath, and 20 to 40 c.c. of a saturated solution of uranium acetate introduced. After standing for thirty minutes at the same temperature, the precipitate is filtered off, washed with a cold 1 to 2 per cent. solution of uranium acetate, boiled with 50 c.c. of magnesia milk (11 grammes MgO in 2 litres of water) to expel ammonia, and evaporated *nearly* to dryness. The nitrogen in the residue is then determined in the usual way, a correction of 0·1 c.c. $\frac{N}{10}$ acid being made for each 100 c.c. of filtrate and washings.

In the following table of results thus obtained with the different feeding stuffs, A represents the nitrogen precipitated by Stutzer's reagent; B by uranium acetate, without subsequent boiling with magnesia; and C by uranium acetate and evaporation with magnesia:

Nitrogen per Cent. as	Barley.		Maize.		Molasses Fodder.		Cotton-seed Cake.			Blood-molasses Fodder.			Sunflower Cake.			Rape-seed Cake.			Palm-oil Cake.		
	A	B	A	B	A	B	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Proteids ...	1·425	1·423	1·198	1·211	1·119	1·121	6·505	6·379	6·385	1·941	1·991	1·934	5·794	5·640	5·650	4·882	4·943	4·853	2·780	2·790	2·736
Other N substances	0·075	0·077	0·081	0·068	0·817	0·815	0·260	0·386	0·380	0·506	0·456	0·513	0·267	0·421	0·411	0·345	0·284	0·374	0·170	0·160	0·214
Total ...	1·500		1·279		1·936		6·765			2·447			6·061			5·227			2·950		
Allowable error ..	0·012		0·012		0·010		0·026			0·028			0·019			0·030			0·016		

C. A M.

INORGANIC ANALYSIS.

Volumetric Method for the Estimation of Copper. S. W. Parr. (*Journ. Amer. Chem. Soc.*, 1900, 652.)—This is a modification of the methods proposed by Wallace and Smith (ANALYST, 1898, 50) and Meade (*ibid.*, 332). A solution containing about 0·04 gramme of copper and 1 to 2 per cent. of nitric acid is reduced by adding a few c.c. of strong sulphurous acid or of 10 per cent. sodium sulphite, and heating. Two c.c. of a 10 per cent. solution of an alkaline thiocyanate are then added. The precipitated cuprous thiocyanate is filtered off on an asbestos filter, and thoroughly washed, until the washings do not decolorise permanganate. The wad is placed in a beaker, 2 or 3 c.c. of a 10 per cent. caustic soda solution are added, and the whole is warmed to 70°. Decinormal permanganate is now run in until the yellow colour changes to green. Dilute sulphuric acid (1 : 5) is added until the solution becomes clear, the solution is warmed to 60° or 70°, and permanganate is run in until the solution becomes pink.

The oxidation may be represented by the equation

$$10CuCNS + 7K_2Mn_2O_8 + 21H_2SO_4 = 7K_2SO_4 + 14MnSO_4 + 10HCN + 10CuSO_4 + 16H_2O.$$

From which it will be seen that 1 c.c. $\frac{N}{10}$ permanganate is equivalent to $\frac{63\cdot3}{7}$ milligrammes of copper. A. M.

AUG 1918
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Determination of Carbon in Ferrochrome. A. A. Blair. (*Journ. Amer. Chem. Soc.*, xxii., 719.)—Twenty-five grammes of potassium bisulphate are fused in a platinum boat 150 millimetres long and 25 millimetres wide. When cold, 1 gramme of the finely-ground sample is spread over the surface, the boat placed in another larger one, into which it fits, and a platinum cover put over it, which prevents any splashing of the bisulphate into the tube. The boat is placed in a platinum tube 400 millimetres long and 30 millimetres in diameter, and closed by a ground joint at the rear. Condensation of sulphuric acid around the joint is prevented by placing two plugs of pumice wrapped in platinum foil between it and the boat. The forward end of the tube is contracted and filled with platinized asbestos to oxidize sulphurous acid, and then still further contracted, bent downwards, and fused to a glass U-tube filled with glass beads.

The combustion is made in oxygen, purified as usual, the heating being started at the contracted end of the tube. The products of combustion, after leaving the U-tube, pass through two flasks heated by a burner and filled with a solution of 150 grammes chromic acid and 300 c.c. sulphuric acid per litre. They then pass through a U-tube filled with glass beads, serving as condenser, next through a tube containing pumice saturated with chromic acid, and then through a calcium chloride tube, after which they enter the absorption apparatus. A gasometer connected to the latter by a guard tube serves to relieve the pressure, which would otherwise be considerable.

As the current of gas and the heating must be very slow, a combustion requires about two hours and a half. After washing the boats and cover they are ready for another determination. Duplicate analyses are stated to agree within 0·01 per cent.

A. G. L.

The Separation of Tungsten Trioxide from Molybdenum Trioxide. Max J. Ruegenberg and Edgar F. Smith. (*Journ. Amer. Chem. Soc.*, xxii., 772.)—The method is based on the fact that tungstic acid is insoluble in concentrated or dilute sulphuric acid, whilst molybdenum trioxide is readily soluble (*Journ. Amer. Chem. Soc.*, xix., 242). Sulphuric acid of specific gravity 1·378 was found to give the best results. The results of six experiments are given, which show the method to be very exact. Another set of experiments, in which the tungsten trioxide (0·2 to 1·3 gramme) was mixed with 5 grammes ferric hydroxide before treating with sulphuric acid showed that the presence of iron is without influence on the solubility of tungsten trioxide.

A. G. L.

Volumetric Determination of Thallium. H. Marshall. (*Journ. Soc. Chem. Ind.*, 1900, 994.)—A weighed quantity of the substance containing thallium in the form of thallous salt is heated with potassium bromide, hydrochloric acid, and a measured excess of a standard solution of sodium or potassium bromate. The bromine formed is boiled off, and condensed in a condenser, the delivery tube of which dips into potassium iodide solution. Part of the bromate is used up in oxidizing the thallous to thallic salt—

$$3TlCl + NaBrO_3 + 6HCl = 3TlCl_3 + NaBr + 3H_2O\,;$$

the remainder is determined by titrating the iodine set free with thiosulphate solution. The author has devised an apparatus entirely of glass for carrying out the distillation. A. M.

Iodometric Estimation of Chromic Acid. K. Seubert and A. Henke. (*Zeit. f. angew. Chem.*, 1900, 1147.)—The method depends upon the reaction:

$$K_2Cr_2O_7 + 6KI + 7H_2SO_4 = 4K_2SO_4 + Cr_2(SO_4)_3 + 7H_2O + 6I.$$

Under ordinary circumstances the action takes considerable time. The authors have made an exhaustive investigation of its rate of progress when the different bodies are present in different quantities. Increasing the proportion of acid accelerates the reaction more than increasing the proportion of potassium iodide does; dilution greatly retards it. The following are convenient proportions to use: Bichromate, 0·05 gramme; potassium iodide, 0·5 gramme; sulphuric acid, 1·8 gramme; total volume, 100 c.c. If less than 0·05 gramme of bichromate be present, the other quantities should still be kept the same. If there be more bichromate, the iodide and acid should be proportionately increased without adding more water, unless there be more than 0·25 gramme. The reaction is complete in about six minutes. The liquid should then be diluted and titrated with thiosulphate solution, using starch as indicator. A. M.

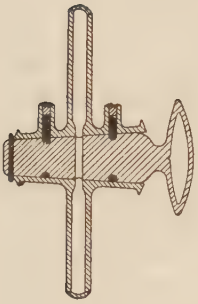
Determination of Phosphoric Acid as Phosphomolybdic Anhydride. H. C. Sherman and H. St. J. Hyde. (*Journ. Amer. Chem. Soc.*, 1900, 652.)—The authors have examined Woy's method (ANALYST, 1897, 250 and 333), in which the molybdate precipitate is ignited, and weighed as $24MoO_3,P_2O_5$, and find the method to give results which agree exactly with those obtained by the molybdate-magnesia method. The second precipitation recommended by Woy is, however, quite unnecessary, equally good results being obtained with only one precipitation. A. M.

The Preparation of Standard Acid. C. L. Higgins. (*Journ. Soc. Chem. Ind.*, 1900, xix., 958.)—The author finds that sodium carbonate as a base for alkalimetry is unsatisfactory, for it is not possible to convert bicarbonate entirely into carbonate without forming some caustic soda. He finds, however, that G. T. Moody's method (*Journ. Chem. Soc.*, 1898, 68) gives very accurate results. Pure dry hydrogen chloride gas is passed into a weighed absorption bulb containing water. The bulb is made entirely of glass, and is fitted with a stopcock and a calcium chloride tube. The increase of weight of this bulb gives exactly the weight of hydrogen chloride absorbed. A. M.

Electrolysis of Copper Sulphate as a Basis for Acidimetry. C. A. Cohn. (*Journ. Soc. Chem. Ind.*, 1900, 962.)—If a neutral solution of pure copper sulphate be electrolysed in the manner usual in copper determinations, copper is deposited, and the equivalent quantity of sulphuric acid is set free. From the weight of copper deposited the exact quantity of acid can be calculated, and the latter can be used as

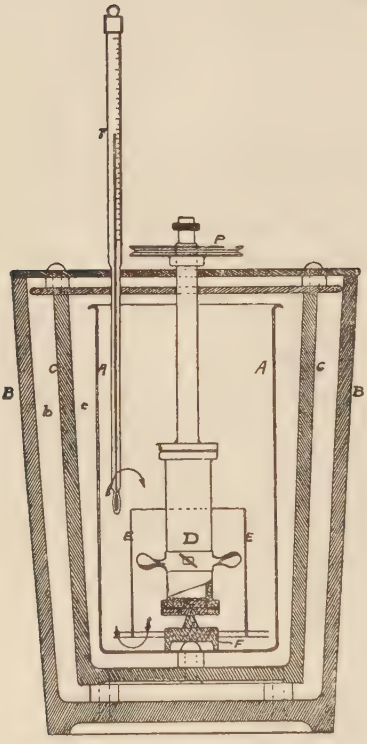
a basis for acidimetry. The results obtained agree exactly with those given by the hydrogen chloride method (see preceding extract). A. M.

APPARATUS.



Gastight Stopcock. H. Göckel. (*Zeits. f. angew. Chem.*, 1900, 961.)—The stopcock is designed so that it may be used in any position. The key has two grooves cut in it, one on each side of the bore. The mantle has two small tubes running through it corresponding with the grooves. The grooves and tubes are filled with mercury, and then the tubes are corked and sealed. To prevent the key coming out, the end is made to project somewhat, and a pin is run through it as shown.

A. M.

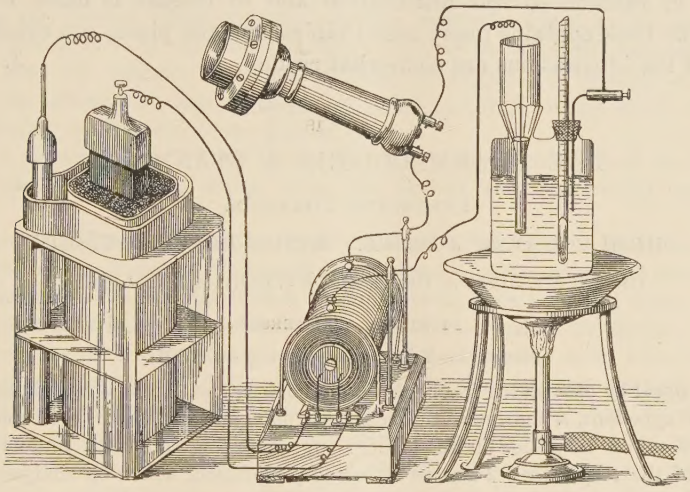


New Coal Calorimeter. S. W. Parr. (*Jour. Amer. Chem. Soc.*, 1900, 646.)—The coal is ground up to pass a 100-mesh sieve, dried at 105° C., and 1 gramme is weighed out and put into the cartridge D; 16 to 18 grammes of sodium peroxide are added, the top is screwed on, and the whole is shaken to thoroughly mix the contents. It is then put into the insulated can A, 2 litres of water are added, the lid of the can is replaced, and the pulley P is connected with a motor and rotated at 50 to 100 revolutions per minute. When the temperature is constant, a hot wire is dropped down the stem of the cartridge, which is provided with a valve to close again after the wire has passed. The maximum temperature is noted, and the heat of combustion C is calculated from the formula $C = (t - \cdot 012^\circ) \times w \times 0 \cdot 73$, where t is the rise of temperature observed, w is the water employed, ·012° C. is the rise caused by the hot wire ($\frac{1}{2}$ inch of No. 12 copper wire), and 0·73 is the necessary factor which has been determined by a special series of experiments.

A. M.

Determination of Correct Melting-points, II. Thomas Tyrer and Albert Levy. (Notes from the Laboratory of the Stirling Chemical Works, July, 1900.)—*Levy's Acoustical Method.*—The apparatus used consists of a small battery, a Ruhm-

korff's coil, a Chrystomanos' beaker (*Ber.*, 33, 1093), and a telephone. An alternating current is used to do away with the secondary current which may be formed by the electrolysis of the substance. The internal diameter of the end of the tube lodged in



the mercury is 4 millimetres. The powdered substance is pressed into this to a height of 1·5 millimetres, by means of a metal rod of diameter 3·5 millimetres, and then mercury is poured in to a height of 20 to 30 millimetres, if necessary, after the tube has been fixed in the beaker. As soon as the substance melts the mercury falls, contact is made, and the noise of the commutator produces a loud sound in the telephone. The method gives good results. A. S. L.

REVIEW.

BACTERIA, ESPECIALLY AS THEY ARE RELATED TO THE ECONOMY OF NATURE, TO INDUSTRIAL PROCESSES, AND TO THE PUBLIC HEALTH. By GEORGE NEWMAN, M.D. Second edition, 1900. Pp. 381. Twenty-three plates and sixty other illustrations. London: John Murray (The Progressive Science Series). Large 8vo. Price 6s.

This book is a popular scientific statement of our present knowledge of bacteria. It is brought well up to date, and gives the results of many of the latest researches. It does not profess to be a practical handbook, although its pages contain many valuable technical hints relating to the preparation and uses of nutrient media, methods of microscopical staining, etc. A chapter is devoted to the bacteriological examination of water, and to the identification of many specific organisms found in water. We are glad to note the emphasis laid upon the necessity of *both* chemical and bacteriological examination of water intended for drinking purposes. The danger of domestic filters other than those of the Pasteur-Chamberland pattern is pointed out. The bacteriological treatment of sewage is dealt with pretty thoroughly, the work of Jordan, Dibdin, and Cameron in this direction being referred to; and the methods of treatment adopted in London, Sutton, Exeter, and Manchester are

described. The bacteriology of milk and milk products, and the dissemination of diseases (especially tuberculosis) through these substances, also receive considerable attention, the advantages of pasteurization being pointed out. The subject of bacteriology in relation to soil nitrification and to disease is dealt with in other chapters. The book contains many useful tables, and the plates are excellent, though one or two of the illustrations are somewhat crude. J. F. H. G.

THE PHARMACOPŒIA A STANDARD.

Important Decision.

HIGH COURT OF JUSTICE. KING'S BENCH DIVISION.

(Before Mr. Justice Bruce and Mr. Justice Phillimore.)

DICKINS *v.* RANDERSON.

(*From the Times of January* 30, 1901.)

This was an appeal by case stated from the decision of Justices of the West Riding of Yorkshire convicting the appellant, a pharmaceutical chemist, upon an information preferred against him by the respondent, an Inspector of Food and Drugs, charging him with unlawfully selling, to the prejudice of the respondent, 2 ounces of mercury ointment, which on analysis was found to be deficient in mercury.

At the hearing of the information, the following facts were proved or admitted: On May 14, 1900, the respondent went to the appellant's premises and asked for 2 ounces of mercury ointment. Ointment was supplied to him in a small wooden box, the lid of which was labelled "The Ointment—Mercurial Poison," for which he paid fourpence. Upon analysis, the substance supplied was found to contain the parts as follows: mercury, 12·5 per cent.; lard and suet, 87·5 per cent. The analyst added to his analysis a statement that mercury ointment, according to the British Pharmacopœia, contained 48·5 per cent. of mercury, and the mercurial activity of the sample would only be one-fourth that of an ointment prepared according to the British Pharmacopœia. It was contended by the respondent that, as the ointment supplied was not according to the standard of the British Pharmacopœia, it was not of the "nature, substance, and quality demanded" within the meaning of section 6 of the Sale of Food and Drugs Act, 1875. It was contended on behalf of the appellant that the proceedings would not lie under section 6 of the Act, but ought to have been commenced under section 7, the article in question being a "compounded drug." This objection having been overruled, the appellant gave evidence that the ointment supplied was a dilute preparation of mercury ointment well known to and supplied by all retail chemists, and such as would be usually supplied to a person asking for "mercury ointment." He stated that out of hundreds of sales of that commodity which he had made he had never supplied it according to the standard of the British Pharmacopœia for human application, except when making up the prescription of a medical practitioner, for the reason that he considered that the frequent use thereof by a person of delicate constitution might probably set up mercurial poisoning, from which death might ensue. Both the dilute and the standard preparation were kept in stock by the appellant's employers at the premises in question. The dilute preparation was known to the public by a variety of names, and it was usually asked for under the name of "blue ointment." Two other chemists gave similar evidence. It was contended on behalf of the appellant that he was not in law required to sell mercury ointment to a purchaser in accordance with the standard quality prescribed by the British Pharmacopœia, except when specifically asked by the purchaser to do so, or when making up the prescription of a medical practitioner; and that accordingly it was within the discretion of the appellant to

supply the diluted preparation in all cases in which he thought fit to do so, and that he had therefore committed no offence under section 6. The Justices found that the commodity sold was not of the nature, substance, and quality of the article demanded by the purchaser, and held that the appellant was bound to supply the commodity according to the formulary prescribed in the British Pharmacopœia, whether expressly asked to do so or not. The questions for the opinion of the Court were (1) whether the appellant was so bound as last aforesaid or not; (2) whether there was evidence to support the finding of the Justices; (3) whether the information was properly laid under section 6 of the Food and Drugs Act, 1875; (4) whether the conviction was good in law.

Mr. C. A. Russell, K.C. (with whom was Mr. Compston), appeared for the appellant; Mr. Danckwerts, K.C. (with whom were Mr. Roskill and Mr. Caine), represented the respondent.

The following judgment of the Court was delivered by Mr. Justice Phillimore: We think that this conviction must stand. The appellant professed to sell mercurial or mercury ointment. Mercury ointment is a drug in the British Pharmacopœia, known by that name, and having a certain fixed ratio of mercury to unguent. The appellant was asked for mercury ointment, and should have sold the drug in the Pharmacopœia, or, if he was going to do what he in fact did—namely, sell an ointment in which the mercury was about one-quarter strength—he should, if he may lawfully sell such a drug (see section 15 of the Pharmacy Act, 1868), have explained that he was selling a weaker or diluted drug, and have so named it. He acted under no sordid motive, but, nevertheless, he was in the habit of selling to his customers something which was not of the nature, substance, and quality which they must be taken to have demanded, and which certainly the purchaser in this case demanded. It is said that the appellant sold the mercury ointment of commerce, and that for commercial purposes there is a standard different from that of the Pharmacopœia. Having regard to section 15 of the Pharmacy Act, 1868 (31 and 32 Vict., c. 121), that is unlikely, though perhaps possible. But he failed altogether to prove that there was any commercial standard for this article different from that of the Pharmacopœia. He did not even attempt to prove it. What he attempted to prove was that there were two commercial standards of wide difference, a thing in itself unreasonable, while he stated that he kept both standards in his shop, and sold according to one standard or the other, according as the customer brought or did not bring a prescription from a medical man. He might almost as well have kept two weights and two measures. The practical mischief of such a practice was pointed out in the argument. If there be any danger on the other side, it would be avoided by the simple expedient of having (if he lawfully may) two drugs, calling them, as in fact they are, the strong one "mercury ointment," the weak "dilute mercury ointment," and recommending the latter to any customer whom he might think unskilled and likely to use the proper drug in a dangerous manner. The cases of White *v.* Bywater (L.R. 19, Q.B.D., 582) and Beardsley *v.* Walter (L.R., 1900, 2 Q.B.) almost, if not quite, conclude the matter. But without them we should have arrived at the same result upon the construction of section 6 of the Sale of Food and Drugs Act, 1875 (38 and 39 Vict., c. 63). They establish the fact, and we should have thought without their assistance, that if a drug to be found in the Pharmacopœia is asked for, this drug must be supplied, and that if it is not sold with the ingredients and in the proportions prescribed by the Pharmacopœia there is at least *primâ facie* evidence that what is sold is not of the nature, substance, and quality which was demanded. It was argued that, as the drug in question was a compounded drug, proceedings ought not to have been taken under the sixth section of the Sale of Food and Drugs Act, but under the seventh, and for this purpose some observations of Mr. Justice Wright's in Houghton *v.* Taplin (13 the *Times* Law Reports, 386) were invoked. We think that those observations have been misunderstood. In any case, it is quite clear from the definition clause that a compounded drug is none the less a drug, which shows that proceedings can be laid under section 6, though it may be that in the case of a

compounded drug they can also be laid under section 7. We wish to add a few words with reference to the exception contained in sub-section 3 of section 6. We entertain no doubt that the appellant sold, to the prejudice of the purchaser, a drug which was not of the quality of the article demanded by such purchaser, and so contravened the provisions of the earlier part of section 6. But the difficulty, we have felt, arises from the provision that an offence shall not be deemed to be committed under that section where the drug is compounded as in the Act mentioned. It was argued by counsel for the appellant that because the article in question was a compounded drug the sale of it fell within the exception in sub-section 3 of section 6, and constituted an offence, not under section 6, but only under section 7. We think it probably did constitute an offence under section 7, but we think it did also constitute an offence under section 6. The offence in subsection 3 of section 6 does not apply to all compounded drugs, but only to a drug compounded as in the Act mentioned. It is very difficult to understand the meaning of the words "as in this Act mentioned." We find no provisions in the Act to which the words can apply. But it seems to us it is impossible to reject the words. We cannot read the exception in sub-section 3 as if it were not qualified by the concluding words. But, although it is difficult to say what is the exact meaning of the words, this, we think, is clear—that no possible meaning that can be given to the words can apply to the ointment in the present case. It was certainly not compounded as in the Act mentioned. The sale of it, therefore, does not fall within the exception.

Conviction affirmed.

INSTITUTE OF CHEMISTRY OF GREAT BRITAIN AND IRELAND.

THE following is a list of the names of the candidates who passed the examination of the Institute of Chemistry held in January, 1901 :

INTERMEDIATE EXAMINATION.—Evans, J., King's College, London, and Pharmaceutical Society. Finlow, R. S., University College of North Wales, Bangor. Hinks, E., King's College, London. Handcock, W. A., Finsbury Technical College, London. Northall-Laurie, D., King's College, London, and under E. Jackson, Esq., F.I.C. Steedman, G., Glasgow and West of Scotland Technical College.

FINAL A.I.C. EXAMINATION.—Branch "A" (*Mineral Chemistry*): Austin, J. H., Birmingham University. Clark, R. M., B.Sc. (Glasg.), Glasgow University. Cotterill, J. W., Birmingham University (for Fellowship). Cunliffe, F., Owens College, Manchester. Dick, W. D., King's College, London. Gray, A., Glasgow and West of Scotland Technical College. Lowson, W., Yorkshire College, Leeds. Robertson, A. J., University College, Dundee, and under R. R. Tatlock, Esq., F.I.C. Branch "B" (*Metallurgical Chemistry*): Bowen, W., Birmingham University. Branch "D" (*Organic Chemistry*): Carter, R. J., B.A. (Oxon.), Oxford University. Etheridge, A. T., B.Sc. (Lond.), Birmingham University. Lloyd, J. A., Birmingham University. Rogers, J., Glasgow and West of Scotland Technical College. Taylor, W. H., Finsbury Technical College, London. Branch "E" (*Analysis of Food and Drugs, not including Examination in Therapeutics, Pharmacology and Microscopy*): Bayly, H. G., King's College, London. Denny, E. J., A.C.G.I., Central Technical College, London, and under F. Sutton, Esq., F.I.C. Hewitt, H. D., Finsbury Technical College, London, and under A. C. Chapman, Esq., F.I.C. Johnstone, J. H., B.Sc. (Vict.), Owens College, Manchester. Branch "E" (*Analysis of Food and Drugs, including an Examination in Therapeutics, Pharmacology and Microscopy*): Chapman, E. M., Pharmaceutical Society and King's College, London. Dewhirst., J. A., Yorkshire College, Leeds, and Pharmaceutical Society. Mitchell, A. H., B.Sc. (Lond.), Owens College, Manchester, and University College, London (for Fellowship). Pinchin, E. A., B.Sc. (Lond.), Royal College of Science, London.